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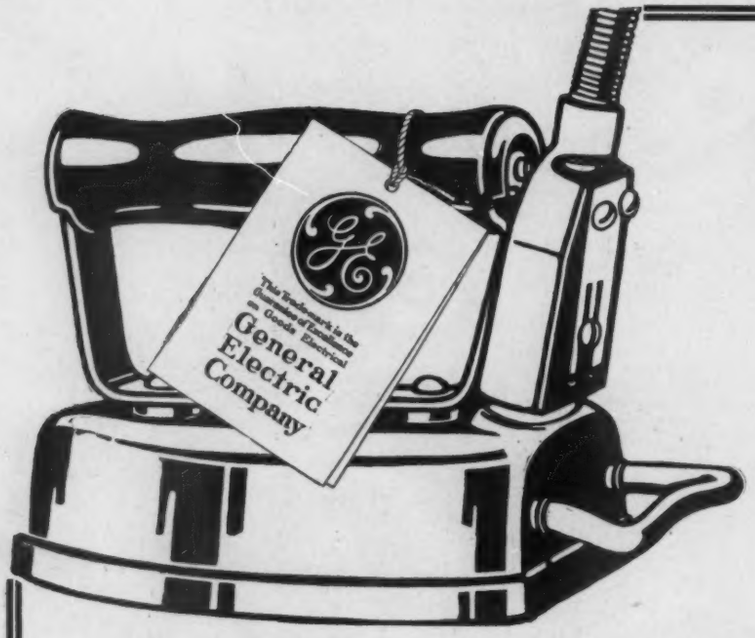

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SAN FRANCISCO'S NEW PATH OF GOLD

Some months ago the Downtown Merchants' Association of San Francisco concluded that a new lighting system was needed along Market street, the main thoroughfare of the city. Consequently W. D'A. Ryan, chief of illumination for the Panama-Pacific International Exposition, was requested to design an effective means of illumination. After a thorough study of the conditions Mr Ryan recommended the use of luminous arc lamps mounted on standards to be supported by the existing trolley poles along the street. Each standard carries three lamps mounted in the form of a triangle with its plane transverse to the street as is shown in the accompanying illustration which shows the type adopted.

Proposed Lamp Standard.

This ornamental standard is to replace the present top piece. It carries three luminous arc lamps provided with a new form of glassware to better diffuse the light. The standards are 29 ft. in height and are to be spread at an average of 110 ft. intervals on either side of the street. In the 1.42 miles from the Ferry to Seventh streeet, 137 poles will be thus equipped. In addition 16 lamps are to be installed on four standards in front of the Ferry Building by the Board of Harbor Commissioners and 4 three-light standards will be erected by the Palace Hotel along New Montgomery street.

The system is to be installed by the Pacific Gas & Electric Company, including lamps, cable, rectifiers and other station apparatus, at a cost of approximately one hundred thousand dollars. The top light on standard is to be wired on a separate circuit and is to be maintained by the city as an all-night light. The two side lights are to be maintained jointly by the merchants, property owners, United Railroads and others.

This system will make Market street one of the most brilliantly lighted thoroughfares in America. The three lamp units will give about fifteen times the present illumination with a current consumption three times as great. Each lamp develops 1900 c.p. at a current consumption of 530 watts, though the tinted glass globe will absorb about a quarter of the light. Not only will the street and sidewalks be illuminated, but also the full facade of each building.

The luminous arc lamps are those which were used at the Panama-Pacific International Exposition. Similar lamps, though not so many in such an area, have been installed in over a hundred cities, something over fifteen thousand units now being used for street lighting.

Such lighting as this should be a continuous advertisement for the city as well as increasing the safety of traffic. The stores will be benefitted by increased patronage due to superior attraction of brightly lighted streets, and the police will find less rowdyism and theft. Good lighting is a paying investment for any community.

Mr. Ryan has stated that this system, which will be known as the San Francisco system, is scientifically correct, and will give the proper amount and kind of light on the street and sidewalks, but it has a very important additional feature. It is decorative, and will give Market street the appearance at night that it should have, a distinction and tone; in other words, in keeping with its character. Present-day methods of street lighting require correct mounting and arrangement of lamps.

GOLDEN GATE 11,000 VOLT CABLE INSTALLATION.

BY S. J. LISBERGER.

(The method whereby the Pacific Gas & Electric Company successfully laid an 11,000 volt cable under the San Francisco Golden Gate is here described. The story is arranged from a paper presented by the author before the San Francisco Section of the American Institute of Electrical Engineers, Feb. 25, 1916. Mr. Lisberger is engineer of electrical distribution for the company.—The Editor.)

Heretofore hydroelectric power has been supplied to San Francisco from the mountain power houses of the Pacific Gas & Electric Company solely via Mission San Jose and the San Mateo peninsula, a distance of 107 miles from the Cordelia substation to Martin station. As a double-circuit steel-tower line had already been constructed from Cordelia to San Rafael, the construction of 9.2 miles of tower line to Sausalito and the laying of a cable across the Golden Gate gave a second means of transmitting power from Cordelia to San Francisco over a route only 43.3 miles in length.

In May, 1915, it was finally decided to carry out the project. To accomplish this it was necessary—

First—To extend the 60,000 volt Cordelia-San Rafael steel tower line from San Rafael to Sausalito, and to erect at that point a step-down substation.

Second—to build a pole line 4500 ft. long from the substation across the government reservation on the Marin shore to the cable landing at Yellow Bluff.

Third—To lay two submarine cables across the Golden Gate, a distance of approximately 13,000 ft.

Fourth—To erect a cable terminal house on the Presidio shore in San Francisco and extend four underground cables to substation "F," a distance of approximately 6500 ft.

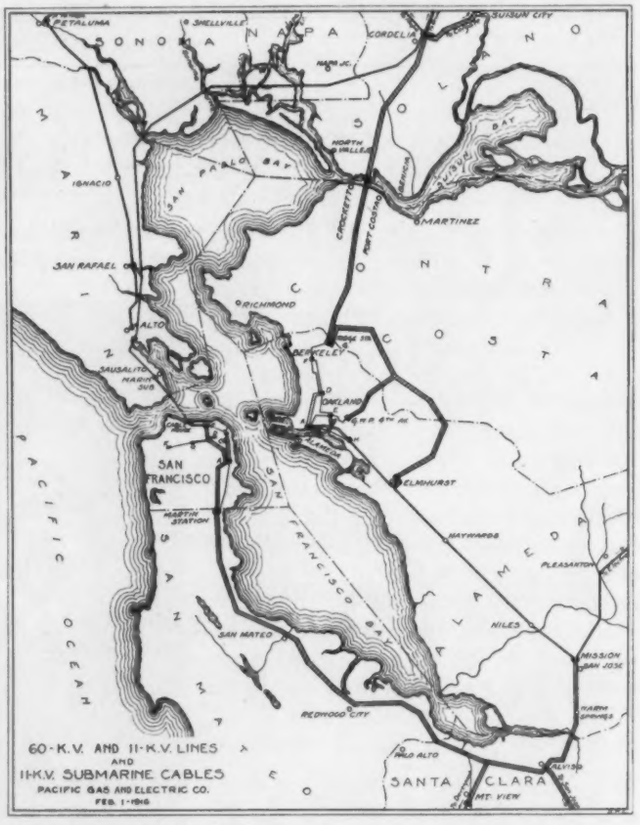
The installation was designed to deliver into San Francisco 18,000 h.p. of hydroelectric energy.

As the voltage of the San Francisco high tension distributing system was 11,000 volts, it was desired to make the cable installation 11,000 volts to conform with this. It was advisable and, incidentally, necessary to cross within the "forbidden anchorage" area between the Presidio shore, San Francisco, and the Fort Baker shore, Marin. This was selected as the best route, taking into consideration water conditions and shore landings, also it was the shortest distance between the high tension station on the Marin shore and substation "F" on the San Francisco side.

In considering the installation it was known that cable of the size required could not be made in one continuous length and that it would be necessary to make at least ten splices for each completed cable. How to relieve splice and joint of strain when laying was a most important problem. Experience had demonstrated that it was impossible to successfully lay a cable which had been spliced on shore and mounted on one reel, because the tension in the joints when laying invariably resulted in electric failure of the splice.

In making this installation, too, consideration had to be given to the six-knot tide which prevailed in this channel; to the depth of water, which exceeded 200 ft.; and to the possibility of ships' anchors fouling the cable in the event they had to drop anchor in the vicinity. The question of repairing the cable, should failure at any time occur, was also important, as the strain on the cable itself when lifted from a 200 ft. bottom would be excessive.

It was, therefore, determined to use the messenger method of installation which had been developed and used successfully by A. J. Pahl of San Francisco. In this, first, a steel rope is laid from shore to shore and anchored securely at both ends. This, called the messenger, can be laid quickly when tide conditions are favorable and acts as a guide line for laying the power cable. When ready to lay the power cable the messenger cable is picked up at the shore end and laid



Map of Pacific Gas & Electric Co. Transmission Lines.

across the barge on which the reels carrying the power cable are mounted.

An ordinary cable grip, such as is used on street railway cable cars, is mounted on the barge. The messenger cable passes over sheaves and through the grip, which is operated by one man. At his will the messenger cable is allowed to slide through or be clamped by the grip; thus the operator absolutely controls the movement of the barge while it is being towed across the water by a launch. The messenger cable must be of sufficient size to withstand all of the strains imposed upon it. However, the power of the launch towing the barge must not be in excess of the holding power of the grip.

With the messenger laid over the barge the launch proceeds to tow, the man at the grip controlling the speed of laying. As the power cable is paid out it is attached to the messenger. After a length of cable has been laid the barge is anchored fast to the messenger, a splice made "at sea" and the towing proceeds. This operation is continued until the barge (which in this case held four reels of cable, approximately 5000 ft.) is empty. The free end of the cable is then sealed with

a special lead sealing-cap, all securely attached to the messenger and lowered overboard, the barge being towed to shore (under-running the messenger), to receive another load of cable. When ready to start laying again the messenger is picked up at the free shore end, laid across the barge and under-run until the free end of the cable comes up, when the splicing and laying is repeated as before. The messenger thus takes all the strain, relieving the cable and joints from all tension.

The Messenger and Anchors.

The messenger in this case was a 37-wire galvanized steel strand 1⅜ in. diameter, in one continuous length of 14,000 ft., having a breaking strength of 90 tons, weighing approximately 4½ lb. per ft., the total weight of each messenger on the reel being approximately 30 tons.

The landing at Yellow Bluff on the Marin shore was not ideal, as there is no beach and the bluff rises from the water's edge 120 ft. almost perpendicularly. Anchors for the messengers were located at the base of this bluff just above the water's edge, short heading tunnels being driven into the rock about 15 ft., in which tunnels the anchor sheaves were located, concrete being used to hold them in place and the whole structure being protected by means of a concrete enclosure. The two tunnels, one for each cable, were located about 100 ft. apart.

The anchorage on the San Francisco shore was constructed on a sandy beach about 100 ft. from the water's edge. The design of this, therefore, was somewhat different from the others, although the iron structure in all of the anchorages was the same.

The messenger was held in the anchorage by means of a series of three-bolt and single-bolt clamps and a mass of melted zinc was poured around in order to assist the clamps. The bridge socket type of anchor was not used, for the reason that it might be desirable to change the tension in the messenger at some later date. The anchorages were designed to withstand a tension equal to the maximum strength of the messengers.

The Power Cable.

The submarine cables were 3-conductor, 250,000 c. m. copper, each conductor having an insulation of 6/32 in. 30 per cent Para rubber, over which was placed a 4/64 in. layer of varnish cambric.

The three conductors were laid together in circular form (a jute filler being used), a 10/64 in. varnish cambric belt being applied over all. The enclosing sheath was 5/32 in. pure lead. Over the lead two layers of jute were applied, the total thickness of which was 4/32 in. The jute formed a cushion for the steel wire armor, consisting of forty-two wires of No. 4 B. W. G. extra galvanized iron, and this armor was in turn covered with a layer of jute 4/32 in. thick, to which was applied a sand and asphaltum finish for mechanical protection.

The shore ends were of the same specification as the main submarine cables, except that the conductors were 350,000 c. m.

Each cable contains a twisted pair of telephone wires, No. 13 B. & S. copper, insulated with varnish cambric 2/32 in. thick, cotton braided and laid in the jute filler in the cable between the conductors and under the outerbelt of varnish cambric. In order that no "ground" might be introduced into the cable the telephone wires were protected at both ends by means of telephone insulating transformers.

Testing Equipment.

In order that the cable might be tested as the work proceeded a testing station was erected in a temporary shed built on the Marin shore and a 2200 volt line extended from Sausalito to the cable landing. This station had a capacity of 200 kw. at 22,000 volts, a suitable water rheostat being provided for voltage regulation. Each length of cable laid was tested with a megger, and when three lengths were spliced they were subjected to a two-minute test from the testing station at a minimum pressure of 20,000 volts between conductors and between conductors and ground. When one complete cable had been laid it was subjected to a test pressure of 22,000 volts for 3½ minutes between conductors and between conductors and ground.

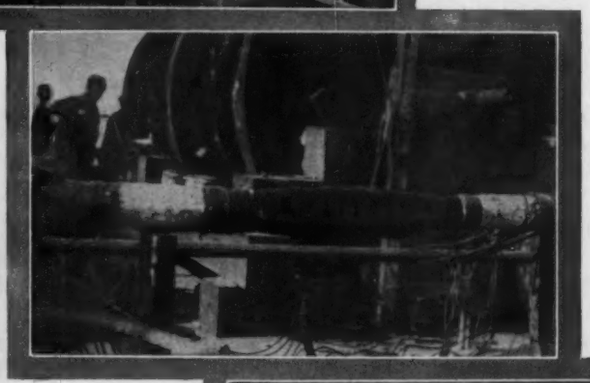
Cable-Laying Equipment.

The barge used in cable-laying was of 125 tons capacity, being 70 ft. long by 30 ft. wide, and when loaded had a freeboard of approximately 5 ft. When laying the messenger the axis of the reel was parallel to the short axis of the barge, a 100 h.p. launch being used for towing.

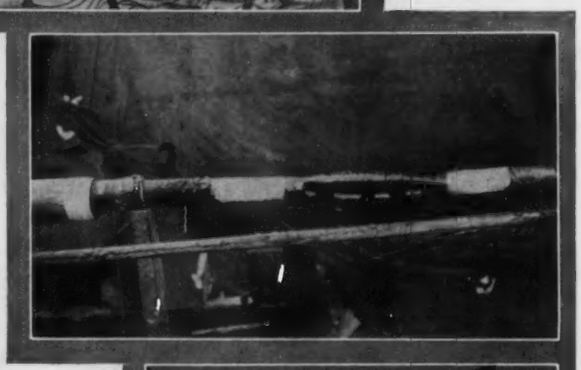
The same barge was used when laying cable, but the cable reels were mounted with their axes parallel to the long axis of the barge; in this way the barge was least affected by the prevailing action of the tide and waves in the channel. The tow for the cable-laying equipment was a 50 h.p. launch; during very heavy tide run two launches were necessary for towing the equipment.

When ready to lay cable the messenger was picked up at shore and laid across the barge. On both sides of the barge grooved cast iron sheaves, 40 in. in diameter, were securely fastened to the deck, a rigging being provided to prevent the messenger cable from leaving the sheave, no matter what position the barge might take. The cable was fed from the reels around spools through the serving machine, together with the messenger cable, the two being tied together by the machine in question.

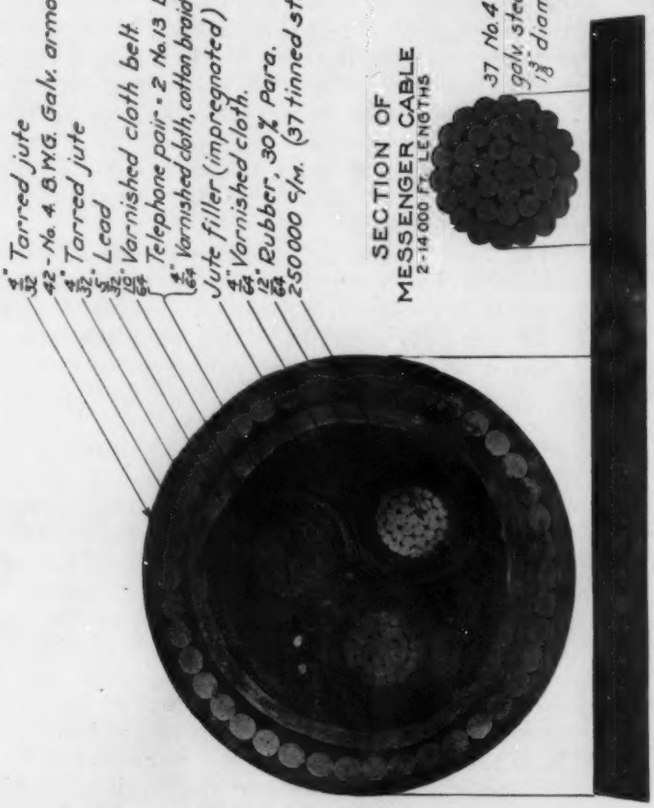
The serving machine, driven by a gasoline engine, consisted of two circular iron rings mounted in an iron frame, the rings being made to revolve by means of a friction drive arranged so that the machine could be started or stopped by the movement of a handle. Removable jaws in the cast iron rings were provided so that the machine could be slipped over the cable and the messenger. Two spools of galvanized iron were held between the rings and near their outer edge. When the cable and messenger were allowed to travel through the serving machine the rings were made to revolve, and the machine would wind around the cable and the messenger a serving of two No. 6 galvanized iron wires. Every 20 ft. the movement of the barge was stopped by means of the grip and a considerable number of turns wound around the cable and the messenger at one point. This was done to secure the attachment of the cable to the messenger at least every 20 ft. in the event the serving wires should break between these wraps. Formerly the work of serving



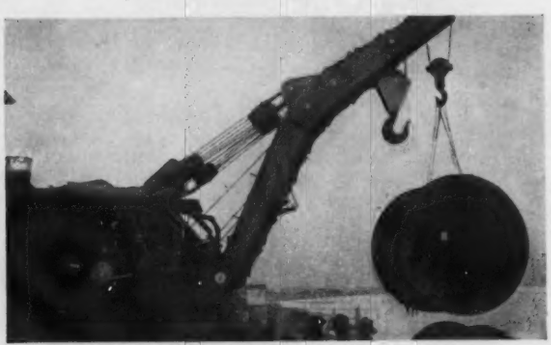
Feeding Cable Around Rolls on Barge.



Splicing Operations on Barge.


SECTION OF
MESSENGER CABLE
2-14 000 FT. LENGTHS
37 No 4 B.W.G.
galv. steel cable.
1/8" diameter
1/32" Tarred jute
42 - No. 4 B.W.G. Galv. armor wires.
1/32" Tarred jute
3/32" Lead
1/64" Varnished cloth belt
Telephone pair - 2 No.13 B.&S. 7 strand
1/64" Varnished cloth, cotton braid & paraffine.
Jute filler (impregnated)
1/64" Varnished cloth.
1/64" Rubber, 30% Para.
250 000 c/m. (37 tinned strands)

Section of 11,000 Volt Submarine Power Cable.

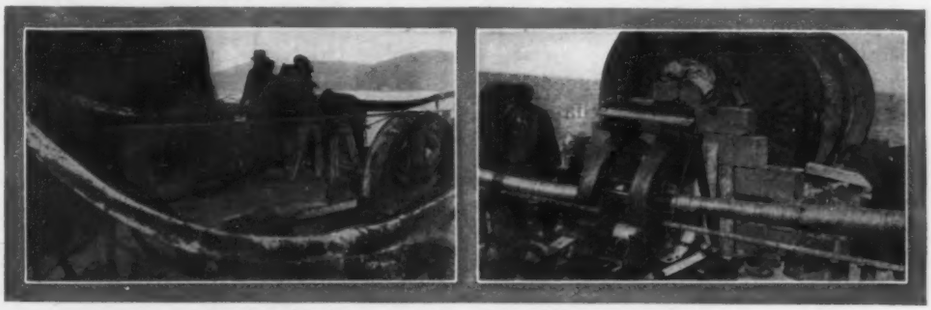


Loading the Power Cable on the Barge.

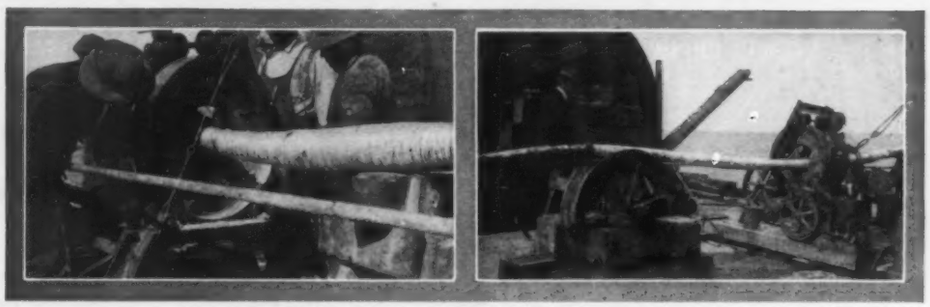
was done entirely by hand, a slow and tedious process; however, with the development of the serving machine for this installation the work was greatly facilitated and much better performed. The speed when laying cable was about 8 ft. per minute.

The Joint.

When a length of cable had been paid out the messenger was made fast in the grip on one side of the barge, and on the other side the messenger and the cable were lashed to the sheave. To make the joint mechanically strong it was necessary to lap the armor about 15 ft. In order to get sufficient armor to make this lap it was necessary to cut off about 15 ft. of cable from the end that projected out of the water. The armor was then folded back and held in place and



Serving Machine Applying Band Wires over Splice.



Serving Machine and Completely Served Splice.

shape by means of holding rings; it being necessary to maintain the original shape of the armor to obtain a good fit when laying it back into final position.

The copper conductors were sweated together, four layers of pure rubber tape applied over each conductors and over this alternate layers of 40 per cent and 30 per cent Para rubber tape, until the insulation on each conductor was approximately 50 per cent greater than the original rubber insulation. Over the rubber tape seven layers of high-grade varnish cambric tape were applied.

The telephone conductors were then spliced, varnish cambric being used entirely for insulation. In order to lessen the induction in the telephone system the twisted pair was transposed at every joint, so that in the completed cable the telephone pair lay first between legs 1-2, then 2-3 and then 3-1.

Varnish cambric spacers were now inserted between the power conductors, and the whole joint made ready for the lead sleeve.

A single lead sleeve 4½ in. inside diameter by 5/16 in. thick and 24 in. long was wiped to the main sheath and the joint filled with ozite, poured at a temperature of approximately 460 degrees F. The size of the sleeve insured a belt of approximately one-half inch of compound around the joint between the insulation and the sleeve. The temperature at which the compound was poured served not only to fill every crevice but to vulcanize the rubber tapes on the conductor in such a way as to form a homogenous mass equal almost in quality to the original insulation.

The joint was sealed and burlap, dipped in hot insulating compound, applied over the splice, care being taken to fill the space at the point of wiping in order that there be no "humps" between the cable proper and the splice; any unevenness at this point made the replacing of armor and serving wires difficult.

The armor wires were then put back into place and the same serving machine again brought into action, except that the serving wires were now fed through slotted bars attached to one side of the circular revolving cast iron rings. As the barge was held fast to the messenger, the serving machine was mounted on rollers, and as the serving wires were laid over the joint the machine forced itself along. Every 12 in. the serving wires were soldered together to protect against the wire unwrapping for any distance in case it should break. Here again the serving machine accomplished in one hour the work that was formerly done in eight hours by hand.

After the joint had been served it was carefully paid overboard, every effort being used to protect it against any undue strains. The cable was not attached to the messenger for a distance of 8 ft. each side of the splice, thus allowing the splice freedom of movement independent of the messenger. With prevailing wind and tide conditions it required on an average of twenty-four hours to pay out one length and make a splice. There were eleven splices for each completed cable.

Laying the Last Length.

Cable-laying was continued in the manner described until within approximately 800 ft. from short, at which point the cable was sealed, attached to the messenger and dropped overboard. The barge was then towed to shore and turned around, the messenger again picked up and the shore end pulled up on the beach. After the shore end was made fast cable-laying was resumed, the shore end being paid out until the end that was dropped overboard appeared, when the final splice was made. The cable and messenger were then under-run to a point midway between two splices, the two hoisted over the reels and then gradually lowered to the bottom by means of ropes. This method was pursued as it was the easiest way in which to handle the shore end. Furthermore, there was no difficulty in handling this because enough slack had been left near the shore to allow hoisting overboard as above described.

Laying of the power cable was commenced September 26th. The log of the work shows that "with the combined efforts of all the towing equipment, a large amount of block and tackle and hard work of ten men, it took one day to raise the shore end up the steep cliff at Yellow Bluff."

Laying and splicing proceeded in the manner described, save that "for three days heavy fogs covered the channel, limiting the view to a distance less than 1000 ft. and causing the men on the barge much uneasiness, as several large ocean-going liners passed very close to the barge." During the nights when these fogs prevailed the log shows that "the watchman broke two fog bells in his endeavor to warn all traffic that he was there." However, the first messenger cable was completed without accident, tested successfully and laid overboard on the afternoon of October 7th, twenty working days being required to make the installation of messenger and cable.

The work on the second cable was started October 16th and completed and tested on October 30th. Extremely heavy tide runs occasioned considerable trouble, the force of the tide being strong enough to cause the messenger to slip in the temporary anchors while the barge was near the center of the channel. This indicated that the force of the tide was strong enough to move the messenger cable, which between barge and shore amounted to a weight of twelve tons in addition to friction of the cable on the sandy bottom and the holding power of the temporary clamps.

In the meantime work on the terminal house and the land cable connections was being rushed, and the tie-in between Substation "F" and the submarine cables was completed and voltage applied from the San Francisco system on November 5th, this completing the cable installation.

Tests.

Exceptional opportunities were available in this installation for determining heating tests on submarine cables and as little data has heretofore been published on the subject the following may be of interest:

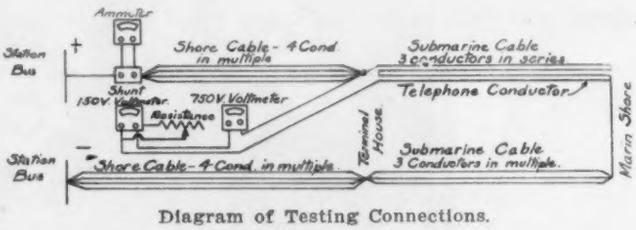
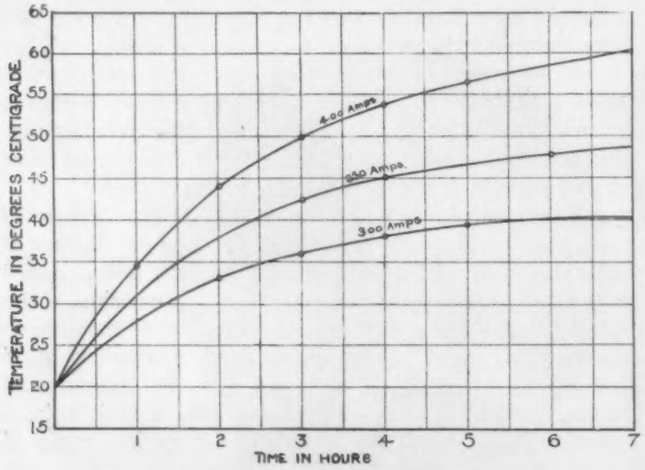


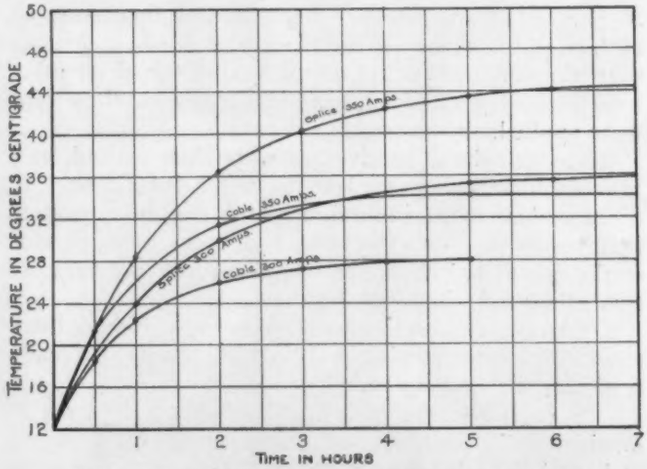
Diagram of Testing Connections.

Having available a 650 volt 1000 kw. direct current generator it was possible by connecting the cables in the manner shown in the accompanying sketch to circulate direct current through the conductors of the submarine cable. The telephone wires in the cable and on the shore ends were used as pressure wires. It was therefore possible to determine the voltage drop in the cable for any given load.

From the observations obtained the accompanying temperature curves were plotted. One shows the rise in temperature of the submarine cable for loads of 300 and 350 amperes, the temperature of the bay water being 12 degrees C. As each cable contained quite a few splices and as the insulation around the splice was much greater than the insulation around the cable tests were made in the laboratory on a splice under temperature conditions similar to that surrounding the splice in the water. The curve shows also the rise in temperature for the splice. It can therefore be seen that cables immersed in water of 12 degrees C. have a considerable higher carrying capacity than would normally be expected. There tests were conducted for a period of 12 hours, which was long enough for the temperature to become steady.



Temperature Rise of Submarine Cable and Splice.



Heat Rise of 350 m. Shore Ends in Air, with 20° C. Temperature of Surrounding Air.

The shore ends 350,000 c. m. are not entirely under water. It was therefore necessary to make the same tests on these cables. The other curve shows the temperature curves for the shore ends. As the life of the rubber insulation depends largely upon the temperature to which the rubber is subjected it can therefore be seen that the safe carrying capacity of the cables is approximately 350 amperes due largely to the radiating capacity of the splices and the shore ends, although under emergency conditions for very short periods of time the cables could safely carry as high as 490 amperes.

No previous mention has been made as to operation of the telephone line. Communication between substation "F" and the Marin substation is as perfect as could be desired.

It would be amiss at this time not to mention that the work of laying the cables was let by contract to A. J. Pahl, to whose experience and efforts much of the success of this work, was due. The construction of the anchorages and the terminal house was under the charge of H. G. Vensano. To Messrs. Jollyman, Thompson and those engineers of the company's staff who assisted in this difficult undertaking, the thanks of the writer are given.

Electric generating stations in China are confined to a few large cities. At Hong Kong the China Light & Power Company has installed 516 kw. capacity and will install 1500 kw. this year; the Victoria station contains 2000 kw. in Diesel engines, 600 kw. in steam engines and plans to install a new steam turbine unit; in the Taikoo dockyard d.c. generators having a capacity of 2250 kw. are driven by gas engines supplied from Mond gas producers, and in the Naval dockyard has a large central station with steam and Diesel engines. At Canton a 1540 kw. steam and Diesel engine plant has been installed. At Shanghai there are two 5000 kw. and two 2000 kw. turbines. An English firm have installed 102 steam engines in China, with a total rating of 28,960 b.h.p. Most of these are used for electricity supply. Another British firm have installed in North China at Soochow a 375 kw., 3-phase alternator, direct coupled to a high speed steam engine, complete with high tension switchboard, etc. In Chang Chow there is a 150 kw., 3-phase alternator, direct coupled to a high speed steam engine complete with water tube boilers, high tension switchboard, transformers, etc. In Tientsin there are two 75 kw. continuous current generators coupled to high speed steam engines, supplied for extension lighting of the Japanese settlement. Further contracts recently secured are for the lighting of two other large Chinese cities; the electrical plant consists of one 200 kw. and one 150 kw. 3-phase alternator. A large number of single-phase and 3-phase motors from 5 up to 100 h.p. have also been supplied for use in cotton mills and other factories. An outlet for electrical plant is found in up-country hospitals, missions, and private Chinese residences where small dynamos driven by oil engines are very much in favor. Many small steam engines and dynamos for lighting river steamers have been sent to South China, as well as small oil driven sets for hotels and private houses.

DIESEL ENGINE PRACTICE.

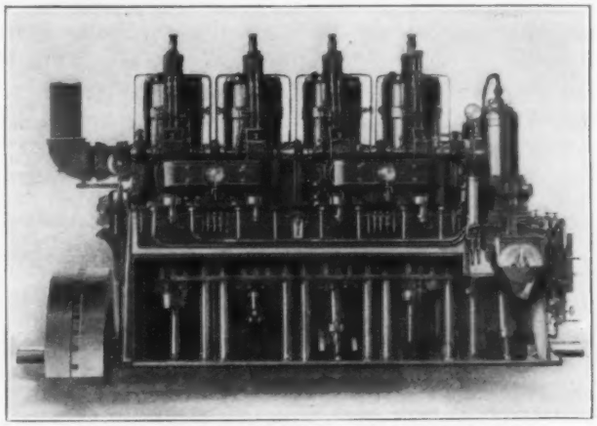
BY J. E. MEGSON AND H. S. JONES.

Diesel Engines Applied to Marine Purposes.

(Continued.)

The Southwark Foundry and Machine Co. are building the Southwark Harriss Valveless Engine. It is of the verticle two-cycle type operating on the full Diesel principle. This engine, though it is made for both stationary and marine application is used most extensively aboard ship.

In the marine engine a step piston is used, the lower portion of which acts as a scavenger air compressor and also for starting the engine. The starting air of relative low pressure, 175 lb. per in., is allowed to enter the lower cylinder, in this way avoiding the necessity of this cold aid entering the working cylinder and causing violent temperature changes. This lower piston also acts as a crosshead, taking the side thrust of the connecting rod. In manoeuvering a vessel the air cylinder is said to assist the working cylinder by using compressed air if it is desirable. The engine is reversible and as the engine operates on the two-stroke-cycle principle this is comparatively simple, due to the absence of valves. The engine is made two to



240 I. H. P. Southwark-Harris Valveless Engine, Diesel Principle, Marine Type.

eight cylinders from 120 to 2000 h.p. This engine is installed in many vessels on the Pacific Coast and many more on the Atlantic.

The Bolinder, a semi-Diesel engine, made in Sweden, has been successfully operated in a number of vessels in this country.

The Polar Diesel Engine Company of Stockholm, delivered the twin-screw two-cycle engines of about 800 h.p. each for the "Sebastian," built at Dundee, but they did not give satisfaction.

In May, 1914, the "Arum," with English-built Polar type engines made her trial. The engines are of the single-acting, two-cycle type. Each of the two engines has 4 cylinders, bore 16.2 in., stroke 3.9 in., speed 135 r.p.m., power rated at 650 b.h.p. each The principal dimensions of the ship are 360 ft. by 47 ft. by 27 ft. depth, 22 ft. draft, carrying 550 tons. After performing various short trips, the "Arum" was sent on her first long voyage to the Persian Gulf, which was perfectly successful according to reports obtained.

The German motorship "Secundus" started her career likewise in 1914. The owner, Hamburg-

American line, now possesses two Diesel motor vessels, "Christian X" and "Secundus." The former has four-cycle Burmeister Wain engines, the latter has two-cycle engines built by Blohm & Voss of Hamburg. Each of these two engines has four cylinders of 23.6 in. bore, the stroke is 36.2 in., speed 120 r.p.m., power 1850 h.p. per engine.

The scavenging air is produced by a pump worked by levers off one of the cross heads. The air enters the cylinders through 4 poppet valves in each cylinder head.

The exhaust gases leave the cylinders through openings in the cylinder walls, and a water-cooled pipe. The lower part of the engine resembles a steam engine, but forced lubrication is employed; the crankshaft bearings are water cooled. The pistons are cooled with fresh water, which may be considered an unnecessary complication.

The "Secundus" made one complete voyage from Hamburg to New York and back. At the outbreak of the war she had not started her second voyage and is now therefore presumably at Hamburg.

The results obtained with a few non-reversible engines of 350 b.h.p., driving propellers with reversible blades promise a great future for such engines for medium size crafts. The reversing of the blades is performed with aid of the engine power. The advantage of this is the excellent security of manoeuvering, which is controlled directly from the bridge. The installation is of course far simpler than one with reversible engines. The manoeuvering air reservoirs are cut out and the auxiliaries are of a far simpler nature.

In designing a motor ship an important question is, how to drive the deck-machinery and the auxiliaries in the engine room. When plenty of money and good personnel is available, the best system is to generate electricity by Diesel engines and drive everything electrically. Where fuel to heat a boiler is expensive, this system is also the most economical in the long run. In first cost it is, however, the greatest, and a staff of engineers is required to undertake many novelties at once. To save first cost and to keep the novelties in the ship within the smallest limits, the best plan is to have two donkey boilers. Fire them either by coal or oil, depending on the price, and drive everything by steam, including the air compressor required to manoeuvre the main motor. When the ship runs several days continuously and the motor is four-cycle, the waste gases can heat the donkey boiler, giving plenty of steam for steering and for the whistle. The gain is about 1 ton of oil per day for ships of about 6000 tons. In short runs, or when the motor has to slow down often, this system cannot be applied. To drive the auxiliaries by compressed air has not proved a success; the air compressors must be too large. In tank ships it is good practice to make the main cargo-discharging pump centrifugal and drive it by a Diesel engine. The same engine can then drive the air compressor for manoeuvering. This system is slightly more expensive in first cost, but, when the ship has to unload often, it is cheaper in service than steam pumps. It also permits the ship to unload the cargo when it would be dangerous to fire a steam boiler.

The New London Ship & Engine Company, which started operation in 1910 have built a large number of the marine Diesel engines produced in the United States, a typical type is shown in section in Fig. 30. Although it has been in operation only a comparatively short time, its record to date is as follows:

Engines built and building	107
No. of cylinders, approximately	600
Total horsepower, approximately	40,000
Smallest engine	60 h.p.
Largest engine	1,000 h.p.

Their efforts have been directed largely toward engines for sub-marines. The engines being applied to merchant service are of the four-stroke-cycle type with the cam shaft on both sides of the cylinder for the operation of the admission and exhaust valve, the fuel valve being vertical in the center of the head.

There has always been a difference between the European and American point of view, due to conditions. It may be stated, in general terms, that, in Europe, capital was scarce, consequently, the European shipowner considered ultimate saving, and was willing to pay a greater first cost for his

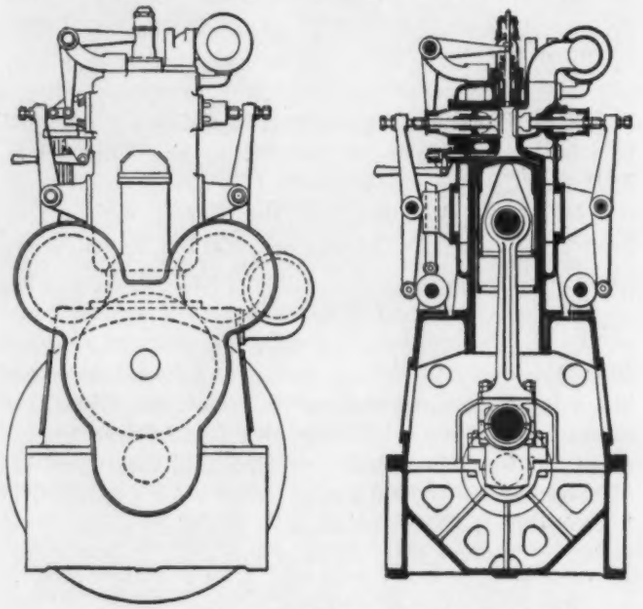


Fig. 30. New London Ship & Engine Co. Engine.

propelling plant, if the operating economy would show on ultimate gain. In the United States, the shipping business has never been given much encouragement, and those who have gone into the business have had to seriously consider first cost. Furthermore, both coal and oil are comparatively cheap in this country. Finally, information in regard to Diesel engines has been obtained principally from the technical description of foreign vessels. It is only comparatively recently that Diesel-engined ships have visited American ports, so that first-hand information from actual observation has been scarce. A further drawback to American development has been the lack of trained operators. In the course of time, the basic advantages will be realized in the United States and the necessary trained operators will be developed.

Many ships intended for trade between the Atlantic and Pacific Coast, through the Panama Canal, are being fitted with to burn oil under their boilers. To

one acquainted with the operation of a Diesel engine, this seems to be almost a wicked waste. The same amount of the same fuel used in a Diesel engine would run four ships instead of one, or would carry one ship four times as far.

Probably the two-cycle motor will eventually become cheaper to manufacture than the four-cycle for the same power. The running economy of the four-stroke-cycle is the greater, especially when the waste gases are passed through a steam donkey-boiler.

The cost to make a good marine engine is, and will remain probably, about 1/3 higher than to make a good reciprocating steam-engine and boilers of the same power, but this higher price is partly compensated by the cheaper ship, because the Diesel engine takes up less room and weight than the steam installations, as the boilers are omitted and the bunkers can be made much smaller. This latter saving depends on the distance or intervals between the places where it is economical to replenish the bunkers.

The large motor ship requires fewer men to run than the large steamship; the quality of the men must, however, be higher. Difficulties with the troublesome firemen are eliminated; but the motor ship if not well attended to, is apt to require more repair in harbor than the steamship.

Balancing these good and bad qualities of motors and steamships, the fuel price in the parts of the world where the ship has to run will generally decide to which the balance will incline. In special cases, however, the fuel price will not be the main factor to be considered, but the following properties of the motor-driven ship are of greater value: That it does not require any warming up of boilers or engines, even if nobody has been on board in advance, the motor ship can start at full speed as soon as the oil tanks are filled. That it is possible for a motor ship to bunker only at very long intervals, three or four times longer than a steamship. And last, but not least, that motor ships can be made in which the part of the ship where the engines are placed is of absolutely the same temperature as the other parts of the ship. In hot climates this quality will go far to turn the balance when the engineers have a say in the decision.

Probably the worst enemies of the marine Diesel engine, during the past ten years, have been the over-enthusiastic advocates. Many have made promises they could not fulfill. Others have built and installed engines which were experiments. New firms are continually entering the field, little realizing that the design and construction of these engines are highly developed specialties. The first engines produced in this way are generally failures; and, unfortunately the good and the bad suffer as a result. The experienced builders approach perfection only by close application, and naturally do not publish all of the practical points which they develop in the course of their work.

The Diesel engine as applied to merchant ships to the present time has proved that this engine, if well designed, well made and well attended to, is reliable enough for the longest voyages and is at least four times more economical in fuel consumption, weight for weight, than a coal-fired steamship, or nearly 3 times more economical than an oil-fired vessel.

THE ELECTRICAL MACHINERY SALESMAN.

BY F. D. WEBER.

An electrical machinery salesman should be a man of honor and high ideals, with a broad enough view of the industry and life to see beyond the order he may be trying to get for equipment. He should have a personal interest in getting every engineering detail of an installation in first class shape and use his influence by showing the purchaser that this means money in his pocket. It is also generally possible for him to show that the first cost of an installation made in a proper manner will be no greater than one done in a slovenly and dangerous way.

By doing this missionary work he will place his equipment in a more favorable position to give satisfaction. When the electrical salesman is not broad-minded, and can not see beyond the order for his particular equipment, his influence is extremely detrimental. Many times he intentionally makes "capital" of the other features of the installation, his method being to tell the prospective customer, "give me your order and we will do all your engineering and you can hire men yourself to actually install the equipment and we will superintend it." Generally, this proposition sounds alluring to the customer who is placing his first order for electrical machinery, especially as it comes direct from the salesman representing a company of high standing as a manufacturer, it means, that unless the salesman's company actually places its engineers at work on the specifications and drawings and conscientiously tries to make a first class installation, the salesman is apt to forget his promise in his haste for other orders and no drawings or specifications are prepared, and at the last minute he attempts to make a few pencil sketches and does a lot of loud talking about how simple the work is and how anyone ought to know how to do such a simple thing and for the customer to go right ahead and there will be no trouble. By this time the customer has employed his men who have the qualifications of good "bo-hunks" for his electricians. They may speak English and many times they can't. Then the troubles start. Generally, with some inspection department, either municipal or underwriters', or both. The customer is furious and rushes to the salesman and tells him his troubles. The salesman immediately tells him that all inspection is a "farce" and that he knows that what he is doing is all O.K. and that he will see that particular inspection department and show them a thing or two. After the salesman has interviewed the inspection department and has told them that this specific work has been passed from "coast to coast," without convincing anyone except himself, he will return to the owner and tell him "I guess we had better get some one who knows how this work should be done."

From the many cases of this kind that have come to the public attention in the last few years, it would appear that the legitimate procedure for a salesman of electrical apparatus would be to confine his efforts to his own line of apparatus and not try to influence his customer into a course which for the time being appeals to "the pocket-book," but which nearly always leads to disaster.

REPORT ON COLUMBIA RIVER POWER PROJECT.

BY L. F. HARZA.

Appendix I—Estimate of Capital Cost and Annual Cost of Power.

In what follows, the capital cost and annual cost of generating power have been estimated upon two assumed plans of development: first, that power of a sufficient amount to pay operating expenses, interest, depreciation and all other necessary charges, is under contract when the station commences operation; and second, that the development of the station load takes place gradually and at uniform rate during the first ten years of station operation.

In the first case the capital cost includes the estimated actual physical cost, plus a margin of 25 per cent for engineering, administration and contingencies, and another margin to cover interest during construction on the full physical cost for one-half of the assumed construction period of five years. The annual expense of generating power includes items for current maintenance and repairs, station attendance, administration, depreciation and interest upon capital investment. Interest has been assumed both at 3 per cent and 4 per cent based upon public construction of the project, and at 6 per cent on securities originally sold at a discount of 10 per cent with 1 per cent added for taxes to represent the cost under corporate financing. To the cost of power thus estimated a margin of 25 per cent has been added in each case for contingencies and profit, the result indicating the minimum practicable price at which power could be sold with a margin of profit probably too small to be considered at this time other than a liberal contingent allowance.

In the second case, or the one based upon a ten-year period for building up the station load, it is assumed that the generating machinery be installed progressively as the load builds up and that this equipment would cost 25 per cent extra because of purchase in this manner. In addition to the item of capital cost previously considered the deficits of the earlier years are allowed to accumulate and add to the capital cost upon which the station must pay returns after becoming a going concern at the end of the ten years. The stated prices of power allow a margin of 25 per cent after the first ten years for contingencies and profit as in the former case.

Two groups of power values are stated—one based upon the sale of only the primary capacity, 480,000 horsepower, and the other upon the sale of the surplus power at 80 per cent of the price of primary power for eleven months' service, 60 per cent for ten months' service, and 30 per cent for eight months' service.

The amount of storage for serving a variable load is small, and power would need to be sold either on the basis of peak demand or at a price per unit of average consumption which would net the stated amount per horsepower of peak demand with due consideration for the load factor of the customer. Thus in the case of a customer having a load factor of 50 per cent, such as approximately experienced by the large electric service companies serving mixed loads in this territory, the actual cost of energy would be twice the stated cost of power per horsepower of peak load, while for electro-chemical industries with high load factor the increase, if any, would be small.

It must be remembered that the following figures represent estimated cost of generation, the 25 per cent margin which has been added not being sufficient to serve as a profit if the project were undertaken as a profit making venture, but rather to insure against losses due to incorrect prediction of cost of generation or to accidental losses. There would also always be the possibility of business failure on the part of a customer, in which case contracts could not be enforced and losses would be suffered by the generating company. If the construction of the project were undertaken without prior contracts for power, then the period required to build up the load would be entirely conjectural, and the ten years' assumption adopted for the following table is meant to be illustrative only. Because of the risk assumed in case of construction under this plan, the early contracts would need to provide a much larger margin of profit than shown.

It will be seen from the following tables that a company such as the local distribution companies, serving a mixed load at a load factor of about 50 per cent, would need to pay a price for power of about $30 to $37 per h.p. year of average consumption, or 0.46 to 0.57 cents per kw.-hr., if the proposed power project were constructed upon the usual basis of corporate finance. These prices are comparable with the costs of generation in existing corporation-owned stations of smaller sizes. They represent merely the costs of generation under the assumed conditions, and include nothing for transformation, transmission or distribution of power, which expenses, if the power is transmitted far, add very greatly to the ultimate cost to large consumers and constitute the major proportion of the cost of serving small consumers. The apparently low prices of power in the following tables thus result from the cases based upon public construction at low rates of interest, and upon the use of the power at a high load factor of 80 or 90 per cent as in the case of the chemical industries, the power being purchased and used in the immediate vicinity of the generating station and at generated voltage.

Table showing annual cost of primary power upon various assumptions if entire load were sold when generating station is ready to operate.*

		Only Primary load of 480,000 h.p. sold		Entire load of 800,000 h.p. sold at relative prices previously stated	
	Interest Rate	Dollars per h.p. year	Cents per kw. hour	Dollars per h.p. year	Cents per kw. hour
Price based upon charge for peak demand or on readiness to serve basis.	3% 4% 6% on discounted bonds	9.02 10.34 15.13	....	6.63 7.58 11.02	....
Equivalent charge for average demand at 50% load factor.	3% 4% 6% on discounted bonds	18.04 20.68 30.26	0.275 0.316 0.462	13.26 15.16 22.04	0.202 0.231 0.337
Equivalent charge for average demand at 80% load factor. Electro-chemical service.	3% 4% 6% on discounted bonds	11.28 12.92 18.90	0.712 0.197 0.289	8.29 9.48 13.80	0.128 0.145 0.211
Equivalent charge for average demand at 90% load factor. Electro-chemical service.....	3% 4% 6% on discounted bonds	10.01 11.49 16.81	0.153 0.175 0.257	7.37 8.42 12.25	0.113 0.129 0.187

*These summary tables are introduced prior to the estimates upon which they are based, for the benefit of any not interested in reading the detailed analyses, which appear later in this chapter.

Total estimated capital cost including interest during construction, $50,000,000 (assumed the same for all rates of interest).

Table showing annual cost of power upon various assumptions if only one-tenth of the power is sold when the station is ready to operate and the sales thereafter increase uniformly until the entire load is sold at the end of the first ten years.

		Only Primary load of 480,000 h.p. sold		Entire load of 800,000 h.p. sold at relative prices previously stated	
	Interest Rate	Dollars per h.p. year	Cents per kw. hour	Dollars per h.p. year	Cents per kw. hour
Price based upon charge for peak demand or on readiness to serve basis.	3%	9.85	.....	7.25	.....
	4%	11.65	.....	8.55	.....
	6% on discounted bonds	18.75	.....	13.70	.....
Equivalent charge for average demand at 50% load factor.	3%	19.70	0.301	14.50	0.222
	4%	23.30	0.356	17.10	0.261
	6% on discounted bonds	37.50	0.573	27.40	0.418
Equivalent charge for average demand at 80% load factor.	3%	12.31	0.188	9.06	0.138
	4%	14.57	0.222	10.70	0.163
	6% on discounted bonds	23.42	0.358	17.12	0.261
Equivalent charge for average demand at 90% load factor.	3%	10.95	0.167	8.05	0.123
	4%	12.95	0.198	9.50	0.145
	6% on discounted bonds	20.85	0.318	15.22	0.233

Under the assumptions used in computing the latter table the physical investment, including interest only during construction, would vary from about $52,000,000 for 3 per cent interest to $55,000,000 for 6 per cent interest, while the total capital investment at the end of the ten-year development period, including the accumulated deficits, would be as follows:

With 3% interest	$61,000,000
With 4% interest	63,000,000
With 6% interest and with securities sold at a discount of 10% the actual cash investment would be	70,000,000
and the face value of bonded debt	78,000,000

As previously stated, exhaustive studies as to the relative economy of several alternative schemes of development have not been possible under this investigation. It was deemed to be more important to carry through a complete analysis of some one general scheme which appeared at the outset to be the most economical and to apply a large part of the available time and means to the solution of these general problems upon which the feasibility or practicability of the project depends. This procedure introduces an element of safety into the estimates to the extent that the development of improved plans in line with possibilities that have been indicated as the work proceeded, but which have not been studied in detail, will tend to greater economy.

The well known and almost universal tendency of engineering estimates to be exceeded in actual construction has been guarded against in several ways to the greatest extent which appears to be warranted.

In nearly all cases where a choice is possible between two schemes the more expensive has been chosen as the basis for estimates, unless the conditions indicate that its ultimate adoption is very improbable.

In the choice between the Camere and Tainter gate types of control dams the latter have been chosen at a cost of $8,837,000 as compared with $3,851,000, the estimated cost of the Camere type. Both figures as given represent the approximate cost based upon a controlled depth of 67 ft. instead of a depth of 81 ft. for which they were actually designed, and are in each case 75 per cent of the cost as estimated in detail for the greater depth. As discussed in Appendix G, tne data which justifies this reduction in depth became available too late to permit redesign and re-estimate of cost by more than approximate computations from which the cost ratio of 75 per cent was deduced.

In the case of the power house location, three choices are possible, as shown on Fig. 7 and as discussed in Appendix H. Project A involves the unwatering of the deep bay of Big Eddy; Project B avoids this at an expense of 580,000 yards in rock excavation, while Project C extends the power house upstream rather than into the gully to the north of Big Eddy, and in doing so eliminates about 379,000 yards of excavation, which, together with other items, saves about $885,000 over Project A. Project A is thus intermediate in cost, but has been adopted for the estimate in the belief that it is as expensive a layout as need be anticipated.

The estimates which have been made for the several schemes of concrete closing dam indicate that it could be built, if built at all, for a cost very little above that of the rockfill dam, and that an actual saving would be effected when the consequent reduction in rock excavation for the shallower flood channel is considered. The estimate as used therefore provides for the most expensive type under consideration.

If a floodway should be built entirely across the river, including the space occupied by the present channel, as has been proposed in case a concrete dam is used, such approximate computations as have been possible in the time available indicate that the piers and gates would not cost more than for the deeper and shorter floodway used with the loose fill dam. The estimate as made will therefore provide for any type of controlling works which has been proposed.

Preliminary quotations have been asked from the manufacturers of the required mechanical equipment. In doing so they were requested to name a figure which would be a safe outside estimate applicable during good business conditions rather than during the present general depression. In all cases the maximum quotation either of competing companies or on alternative schemes from the same company was used.

Unit prices. Cost estimates have been made up from unit prices believed to be ample.

The nearest past approach to the problem of excavation which would be here encountered was in the case of the Chicago Drainage Canal. The costs varied in that case from 38.3 cents to 56.5 cents per cubic yard, as given by Gillette, not including, however, the cost of drill-sharpening and plant interest and depreciation. The several portions of the excavation for this project have been segregated according to ease of disposal, and have been given base prices varying generally from 80 cents to one dollar per yard, except in the case of the removal of the natural rock cofferdam at the power house site, where a price of $1.75 has been used. Rock excavation in the power canal has been placed at 80 cents per yard, as its location is well suited to rapid loading on adjacent tracks by overhead bridge or traveling cableway. Rock excavation for the flood channel has been placed at 90 cents per yard, and for the diversion channel at $1

per yard, because of less convenient locations for disposal. It has been found that, by filling up the valley on the Washington side at the damsite to elevation 180, together with the use of rock for rock fill dam, raising of railroads, for concrete, etc., the entire excavation can be disposed of with a haul not exceeding about one mile except for that used in raising of the railroads. The amount of required rock excavation is so large as to warrant the development and installation of special equipment for economical handling, and the unit prices anticipate the use of such equipment.

The handling of loose rock above the cost of excavation already given has been placed at 60 cents for filling cribs, 50 cents for raising on to rock pile for Scheme A of closing dam (see Fig. 30-A), 50 cents for loose fill on closing dam of any type after diversion of river, 75 cents for loose fill in Scheme B prior to diversion, $1 per yard for a blanket of crushed stone 10 ft. thick on upper face of a rockfill dam, 50 cents per yard for earth and sand blanket, $2 per yard for riprap paving 2 ft. thick.

The unit prices have been varied from $70 per ton for reinforcing steel to $80 and $90 per ton for structural steel, depending chiefly upon the differences in cost of falsework, field riveting, and other erection items. These prices are sufficient to cover rail transportation from the east, although water transportation through the Panama Canal is now quoted at about $6 per ton less than the rail rate. The items for the most expensive work are as follows: base, f.o.b. Pittsburg, $35; freight, $18; fabrication, $15; erection, $15; design overhead and insurance, etc., $7; total, $90. Steel for the roller dams, patent for which is controlled in Germany, has been estimated at $140 per ton, including operating machinery, this figure being based upon known selling prices. Cast steel has been estimated at 8 cents per pound for the large conical pedestals in the tainter gate bearings and other castings of similar size. For small castings where many are required 10 cents per pound has been used.

The price of plain concrete has been varied from a minimum of $5 per yard for massive work to a maximum of $12 per yard, exclusive of steel, where walls are thin and forming expensive. In most cases steel reinforcement has been estimated separately, but where not the unit cost of the concrete has been increased by an amount depending upon the percentage of steel required, the unit cost per yard including steel amounting in some cases to as much as $18.

In the work on the Dalles-Celilo canal the U. S. Engineers have screened the tailings from their rock crusher, gaining thereby about one-half enough sand for concrete and have obtained the other half from a sandbar about one-half mile above the dam site. There is an ample supply of similar sand and gravel in bars not far from the work and in a small valley on the Washington side immediately adjacent to the dam site. It is believed that the assumed prices for concrete are ample, considering the large amount required and the massive nature of the structures.

Timber in booms has been estimated at $22 per M. exclusive of hardware, and in cribs at $30 per M. The former would require no cutting or fitting, the labor being that only of handling and drift-bolting.

The power house superstructure has been estimated upon the basis of walls four feet thick at $16 per cubic yard and roof at 50 cents per square foot. The resulting price per cubic foot is 6½ cents, which compares favorably with costs recorded for other similar buildings when the fact is considered that the floor and foundations have already been included in the cost of the substructure.

Temporary rubble masonry with very lean mortar and minimum hand work for retaining walls in Scheme A, Figure 30, has been estimated at $2.50 per yard, and permanent rubble for exterior slopes of canal wall at $3.50 per yard. The chain bags for Scheme D are estimated to cost 7 cents per pound, and the chain manufactured on the concrete arch, for Scheme B, 9 cents per pound.

The total estimated cost of railroad regrading to the profiles shown in Fig. 5 has been based upon a unit price of 40 cents per yard. In reality most of this material would be spoil from the excavation, and train service would be the only extra charge required, the cost for which would be much less than indicated. Some gravel and sand would be borrowed from nearby bars or dunes, and used to fill under the ties during raising of the track. The price assumed is sufficient to permit all material to be borrowed in this relatively expensive manner.

The entire estimated values of all agricultural and other lands, fishwheels, power site at the mouth of the Des Chutes River, land required for proposed development, and all other private properties in any manner affected, have been multiplied by three in arriving at the general property damage.

(To be continued.)

Flow of water in irrigation channels is discussed in a paper to be presented by G. H. Ellis before the American Society of Civil Engineers on March 15, 1916. He deduces the general formula $V = C R^{0.80} S^{0.5}$, where V is the velocity in feet per second, C is a coefficient depending upon the roughness of the channel, R is the mean hydraulic radius and S the slope. For concrete channels C is 105, for wood 100, and for earth 60.

The break in the Seattle pipe line supplying water, in the opinion of R. H. Ober, who was engaged to investigate the trouble, was not occasioned by the decay of the wood staves of which the pipe is constructed, nor by reason of the fact that the pipe was constructed of wood instead of some other material. The formation of a vacuum as a result of the freezing of the standpipes would have caused the collapse of a steel pipe or of a reinforced concrete pipe as surely as of the wood stave pipe, and the repairs that would have been necessary in the case of the steel or reinforced concrete pipe would have required a much longer time and larger expense than in the case of the wood stave pipe. It is believed that the injury to the pipe lines and the consequent interruption of the water supply of Seattle were due to lack of care in the construction of the standpipes and to failure to prevent the water in these standpipes from freezing.

"WIRE YOUR HOME" MONTH.

BY JOHN A RANDOLPH.

A few weeks ago the leading advertising men of the electrical industry met in the offices of the Society for Electrical Development at New York to formulate plans for a novel trade movement soon to be conducted by the united electrical interests. It is known as "Wire Your Home" month and will be held from March 15th to April 15th.

Heretofore, many of the central stations, manufacturers and other electrical interests have conducted disconnected spring wiring campaigns. There has always been lacking that scope and momentum which comes from a common effort in which individual activities of this nature are amalgamated in one big drive with all the interests enthusiastically working shoulder-to-shoulder to achieve the common cause. It has therefore been wisely considered by the electrical men that with the entire industry acting as a unit, during "Wire Your Home" month, in extending electric current to the homes of the country that are now without it, much better results can be obtained than through individual efforts.

One of the reasons why such a campaign is timely is that not 8 per cent of the homes of this country are wired for electricity. The best figures available show that not 20 per cent of those houses adjacent to central station lines are wired. One statistician places the number of these unwired houses in the United States convenient to electric service at 1,900,000.

With the prestige of electricity now established on a nation-wide footing, with its practicability for industrial, domestic and commercial pursuits proved to the satisfaction of the most skeptical, arguments to induce people to adopt electric service should hardly be necessary. The majority of people are well aware of the advantages of electricity, but the inertia of indifference and the "satisfied-as-it-is" attitude acts as an obstacle in the path of conversion to the "Do It Electrically" doctrine. It takes an impulse to arouse in the face of such indifference sufficient interest in things electrical to lead to the adoption of electrical service. Another deterring factor is the trouble of getting bids; the multiplicity of detail involved in determining just what is wanted, in going over the details with perhaps, several contractors and coming to a decision and closing the matter. Then, many people have been misled into believing that the cost of installing will prove burdensome. With others, the false impression exists that wiring the house will necessitate extensive tearing up of floors, considerable breaking away of walls with consequent dirt and litter. They argue that they do not wish to undergo such annoyance.

In a successful house wiring campaign these deterring factors must be met. The householder must be stimulated from a passive into an active desire for electric service. Definite concrete offers must be presented for selection. These must be of such a nature and of such costs as to meet the probable needs of the majority of prospects. Finally, the cost factor must be met by arranging terms of easy payment that will suit the means of the prospects and lift the burden of a considerable cash outlay from their shoulders.

The coming campaign aims by a concerted, shoulder-to-shoulder movement of the central stations, electrical manufacturers, contractors and other electrical interests to afford any easy, simple and economical means of solving these problems together with offering special inducements that cannot fail, in many instances, to secure contracts.

To properly launch the campaign the Society has sent broadcast to the central stations, manufacturers, dealers, jobbers and contractors of the country 25,000 copies of an announcement setting forth the object and nature of the movement with an appeal to all electrical interests to join in the campaign. Following the announcement, they issued 25,000 copies of a 28 page booklet entitled "Successful House Wiring Plans" which contains a large number of campaign plans which have been tried in various parts of the country with highly successful results. To give further prominence to the movement, the Society will issue a special news sheet to be known as the "Electrifier" which will be similar to the "Exciter" distributed during "Electrical Prosperity Week." The Society is issuing to its members a special service of window display suggestions. It is also handling the general publicity in the trade press and newspapers, including its electrical page service to the newspapers.

The manufacturers are co-operating actively in the movement by distributing a large amount of special campaign matter, conducting extensive advertising, supplying cuts, and mats for use in local newspapers, and in furnishing assistance to their dealers in various other ways. They are sending out 10,000 copies of an unusually attractive window display, to the central stations, jobbers and contractors. It consists mainly of a trim made up of circular transparencies arranged for attaching to the glass of the window. Each transparency contains, in colors, a view of a room in a modern home, equipped with the electrical appliances commonly used in that part of the house. Each view is connected by a tape to a view at the rear of the window box representing a hand in the act of closing an electric button switch. A header or caption mounted on the window pane above the display calls attention to the campaign. The display carries a strong appeal which is at once apparent. It cannot fail to bring prospects into the store or display room wherever it is used.

This generous co-operation on the part of the manufacturers is highly important inasmuch as nearly every central station, contractor, jobber and dealer in the country has a contract with some one of the lamp companies.

It is the aim of the organized interests in the "Wire Your Home" campaign to awaken enthusiasm in the industry itself, to the end that special efforts may be made to extend everywhere complete electric service. It is rightly judged that the spring is the ideal time for such a campaign. With the combined efforts of lamp and affiliated manufacturers, together with local central stations, jobbers, contractors and dealers, conducting a concentrated campaign through the offices of the Society for Electrical Development, thousands of homes are sure to be wired with consequent benefits to all.

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POWER AND GAS

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NOTICE TO ADVERTISERS.

Change of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

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Importance of Knowing Costs

Some months ago, in commenting upon the activities of the Federal Trade Commission, the statement was made in these columns that "it is as yet too early to prophesy what will be the result of the commission's close range study of the various problems which it is called upon to meet. Without doubt however the business men of the country will become better acquainted with the laws under which their businesses must be conducted." This statement is more than borne out in the notable address by Edward N. Hurley, vice-chairman of the commission, before the electrical jobbers at Detroit and as read at Del Monte.

After speaking of the benefits of co-operation he makes a strong plea for better accounting methods and business practice. He shows that a manufacturer who does not know his cost of production, a jobber who does not know his cost of selling, or a contractor who does not know his cost of construction "is not in a position to intelligently meet competition and invites business disaster." He commends the association for its zeal in trying to help the contractor to become a better merchant. He said:

"It is a fact well understood among business men that the general demoralization in a large number of industries has been caused by firms which cut prices, not knowing what their goods actually cost to manufacture, and which almost wholly lose sight of the cost of selling, which is equally important. Are the officers of the companies who are cutting prices right and left, irrespective of their costs, fair to their customers, stockholders or competitors?"

This accurate knowledge of costs should be accompanied by an improvement in methods, changes in design and standardization of processes and products. With such forms of constructive criticism it appears that this new commission can justify its existence and earn a permanent place among the country's economic institutions.

Guidance for the Misguided

Although the capitalization of good will, like that of franchise values, is not favored by public service commissions, each is an indispensable element in the successful conduct of a public utility. While the need for a franchise is self-evident, the necessity for public good will is not always fully appreciated. It is sometimes thought that the will of the people, whether good or ill, makes little difference in the amount of the utility consumed. This was the original doctrine of quasi-public service corporations. The service was looked upon as a monopoly-controlled necessity.

Today the situation is different. There is not only competition between public utility companies but also between different kinds of service, as is exemplified by jitney competition with the electric railway, wireless competition with the telegraph, or electric competition with gas. Patronage depends upon the quality of the service rendered and the good will of the public served. Furthermore good will is a vital factor in the rate situation and is an effective deadener of agitation for municipal operation of public utilities.

Thus it is seen that while good will is not a tangible asset it is none the less essential to the success of a public utility. A man seldom attempts to place a cash value on his friends, yet they may contribute indirectly to his success. Likewise with a public utility, for good will is friendship, just as clearly as ill will is enmity.

The greatest problem now facing the public utility industry is the betterment of public relations. The engineering problems are well in hand, the financial difficulties are understood, but the human questions are unsolved. And it is upon the solution of the human question that the fate of the public utilities of this country now depends.

The importance of this point has, perhaps, been more fully realized by the electric railway men than by any other branch of the industry. They have adopted an admirable code of principles as the corner stone of the edifice of better human relations which they are erecting. Recognizing that the real and enduring friendship of the people can be cemented only by confidence, they are endeavoring to win it through frank and honest dealings in all details of corporation affairs. Finally the structure is being reared by the aid of aggressive advertising to teach the public that the best interests of the community and the company can be served by a partnership relation, and that the quality of the service which the company is able to give the public depends largely upon the sale of its bonds, which in turn is affected by the community opinion of the company.

Much that has been written about this subject is banal and fails to reach the root of the trouble. That the thought of the most of the people has lagged behind the great change in economic conditions during the past fifty years may be partly due to the inertia of the educational systems. Though more than half our population is now urban in character, the methods of education are still largely those employed when the rural element predominated. As a consequence most people do not seem to comprehend the new responsibilities which have come with new provileges.

As President Wilbur of Stanford University suggested in a speech before the Commonwealth Club of San Francisco last week, American universities, in particular, are not democratic enough. The same criticism is made by those conducting school surveys. There is a tendency toward an intellectual aristocracy without giving proper opportunity to the great majority to receive either vocational training or a proper appreciation of the best qualifications for leaders.

It is therefore comparatively easy for those who seek political preferment to become the leaders in American politics, while the abilities of more capable men are overlooked. There is as great need for intelligent followership as for wise leadership. With more attention paid to moral efficiency, with a higher standard of right and wrong and a more enlightened selection of leaders many of the present abuses of our civic life would be eliminated.

This is the groundwork which public service officials should lay. The trend of education should be to obviate envy and to emphasize the common welfare. In proportion as this is encouraged by public utilities, will they be able to correct the evils by which they are now threatened.

It is only by improving the present ideals, or rather lack of ideals, that it will be possible to eliminate the antagonism between those who have and those who have not. A broader conception of human relationship on the part of those engaged in the public service is the only antidote to the poison of ill will which is being insidiously introduced into the body politic.

Men will be governed precisely as they deserve and desire. By teaching them to be more deserving and by raising the standards of their desires is the logical way to bring about good government.

Concretely expressed, this means that the manager of the public service company should take an intimate and personal interest in the affairs of the community. In this way he may learn to correct all those corporation practices which are detrimental to the common weal and earn the confidence of those he would serve. In perfecting the physical equipment of his system, he should not neglect the human nature side of his business. The same thought applies with equal force to each and every employe, for to some consumer or group of consumers he personifies the company.

Self-Contained Lighting Units

In the manufacture of lighting fixtures those who strive to realize their ideals are so often disappointed by that quick-change artist,—the lamp manufacturer,—or, through the misapprehension of a buying public uninformed as to what is best, that it is not surprising to find a carelessness creeping into this branch of the electrical business. This gives ground for the fear that the fixture field may be captured by those who merely have something to sell and no other object in view than to sell it.

Among those fixtures which fall far short of the "realizable ideal" are several makes of self-contained lighting units. These are so named because, though of the indirect or semi-indirect class, they are provided with their own secondary light-giving area and so do not depend upon reflection from the ceiling and walls.

Certain sections are suffering from a plethora of these fixtures through an all too successful selling campaign together with the advent at its launching, of the introduction of the Type C Mazda lamp. That fixtures of this kind contain great possibilities, even making these desirable classes of illumination suitable in heretofore impossible situations, goes without question but it is a pity to find uninstructed or dishonest specialty salesmen attributing the increased lamp efficiency to these self-contained and often inefficient lighting fixtures.

For the fixture manufacturer designing these units, for it is everyone's field, the foregoing comments are of value. These fixtures should be made practical and as far as possible scientifically correct both in themselves and their installation. In this way the electrical trade can win back this business from the hardware dealer and the outside jobber and by aggressive selling and advertising aid in keeping electric lighting in the premier place it should occupy as an illuminant.

PERSONALS

F. N. Averill, manager of the Fobes Supply Company, has returned to Portland from San Francisco.

Harry Byrne, general manager of the North Coast Electric Company, has returned to Seattle from a trip to California.

F. H. Murray, representative of the National Carbon Company of Los Angeles, was at San Francisco the first part of the week.

H. B. Squires, manufacturers' agent, recently returned to San Francisco from a business trip throughout the southern part of the state.

H. S. Whiting, vice-president of Pierson-Roeding Company, San Francisco, spent a few days in Los Angeles the latter part of the week.

Guy Rose of the Moore Rose Company, electrical contractors and dealers of Healdsburg, Cal., was a recent business visitor at San Francisco.

H. H. Hughes, representative of the Westinghouse Electric & Manufacturing Company at Fresno, Cal., was a recent business visitor at San Francisco.

C. R. Hunt, Pacific Coast manager of the Robbins-Myers Company, left the latter part of last week for an extended business trip to Seattle and the Northwest.

E. A. West, newly-appointed chief engineer for the Denver Tramway Company, is on his way to assume his new duties via Los Angeles and Salt Lake City.

E. M. Cutting, Pacific Coast manager of the Edison Storage Battery Supply Company, has left San Francisco via Portland and Seattle to visit the Eastern factory.

T. W. Simpson, Pacific Coast manager of the Federal Sign System (Electric) has left for a business trip throughout the Northwest and expects to be gone about ten days.

Geo. S. Quinan has been appointed engineer for the Seattle division of the Puget Sound Traction, Light & Power Company, **S. C. Lindsay** being electrical engineer of the division.

H. W. Turner, president of the Washington Electric Supply Company and **H. L. Bargion,** general manager, have returned to Spokane after attending the jobbers' meeting at Del Monte, Cal.

Quinton Adams has recently joined the sales force of the Westinghouse Electric & Manufacturing Company at San Francisco, having been transferred from the New York office of the company.

Thos. Finigan, Pacific Coast manager of the American Brake Shoe & Foundry Company, left last week to attend the electirc railway convention in New York. He expects to return in about ten days.

F. Van Vleck, formerly connected with the Bristol Company's exhibit at the Panama-Pacific Interntional Exposition, has recently left San Francisco for Waterbury, Connecticut, to do some speiial work in the Bristol Company's laboratories.

E. Doherty, representative of the American Electric Heating company of Chicago, Ill., is a recent visitor on the coast. **E. G. McBrearty,** who was formerly their representative, has opened up an office of his own in the real estate business in Detroit.

E. H. Le Tournean has been promoted from the position of assistant engineer to efficiency engineer of the Portland Railway, Light & Power Company, taking the place of **E. A. West,** who resigned to become chief engineer of the Denver Tramways.

A. S. Armstrong, representing R. J. Davis, agent for Century single phase motors and fans, has returned from a trip through the Sacramento Valley. **Paul A. Shilton,** Southern California manager for R. J. Davis, has been visiting the Imperial Valley during last week.

MEETING NOTICES.

Portland A. I. E. E. and N. E. L. A. Sections.

The tenth bi-weekly luncheon of the joint sections of the A. I. E. E. and the N. E. L. A. was held at the Chamber of Commerce, Portland, Oregon, at noon, March 2d. Mr. A. S. Moody acted as chairman. The speaker of the day was Robert G. Diecks, commissioner of public works of the city of Portland, Oregon. His subject was the "Causes of Slides in Portland and Reasons for Same." Mr. Fuller, vice-president of the Portland Railway, Light & Power Company, gave a lengthy discussion of the subject from his personal experience.

Jovian League of Los Angeles.

A liberal education in mythology was received by those attending the luncheon Wednesday, March 1st in the discourse delivered by Seward A. Simons, entitled "By Jove." Mr. Simons is a brilliant orator, and a recognized authority on mythology, and his semi-humorous dissertation on the Roman deities of the days of legend, was very interesting and entertaining to every one present. Giving due credit to the gods for their prowess and skill, he declared that these splendid apparitions of the past had nothing on the present day deities of the electrical industry. He presented facts and figures showing their feats to be insignificant beside the remarkable wonders now being wrought with the very element that gave them fame,—electricity. This is the last of a series of talks given before the league by various speakers, on the subject of "Jove." Preident Holland presided, and Fred C. Moon of the Otis Elevator Company was chairman of the day.

San Francisco Electrical Development and Jovian League.

The March 1st luncheon, of which N. J. Pendergast, division advertising agent of the Pacific Telephone & Telegraph Company, was chairman, was one of the most instructive and interesting of the current year. Before President E. M. Cutting turned the meeting over to Chairman Pendergast a band of Hawaiian musicians entertained the members with songs and music. Dr. William T. Bawden, specialist in industrial education for the U. S. Educational Bureau, was then introduced and explained the purpose and methods of the school survey now being conducted in San Francisco, the first city to be thus studied, though a number of state educational systems has been similarly investigated. As a result of this survey, definite recommendations for improvement will be made by the twelve experts who have been conducting it. Dr. Bawden also spoke on the recent progress in vocational training, an effort to make education more democratic. His thought, that the schools, besides being concerned, as at present, primarily with education for wise leadership, should also provide education for intelligent followership, was ably seconded by Dr. John W. Withers, president of the teachers' association of St. Louis. Dr. Withers showed that although the past century has brought about a tremendous change in the customs of our people, a corresponding change has not been made in our educational system. While the present age knows how to make wealth, it does not know how to use and appreciate it. He spoke of the necessity of educating the rank and file to an appreciation of the best qualities of a leader. He argued for municipal as well as state universities in meeting this need. The remarks of both speakers were heartily applauded and a rising vote of thanks extended to them at the close of the meeting.

TRADE NOTES.

C. F. Braun & Company, consulting mechanical engineers, 503 Market street, San Francisco, have made arrangements to manufacture locally feed water and service heaters; water purifying apparatus, including filters, softeners, and sterilizers; feed water grease extractors; expansion joints, anchors and guides; cooling towers; water debris strainers; and steam separators and exhaust heads.

ELECTRICAL JOBBERS AT DEL MONTE.

"Two score and ten" electrical men spent four days' time and unmentioned money at Del Monte, March 1-5, learning how to play the game ethically,—golf as well as electrical. Notwithstanding prevalent Scotch mists the enthusiasm was not dampened nor was the Scotch missed. Thursday and Friday, by means of the Darwinian theory, the twelve jobbers and twelve manufacturers best fitted were selected to compete in the match play on Saturday morning, when the jobbers persisted in starting to play in the rain—with disastrous results to themselves, as the following results show:

Team Play for Manufacturers' Cup.

Jobbers—		Manufacturers—	
Hillis Turner	1	Sanderson Gregory	
Holabird Hall	2	Murray Oakes	
Carter, H. V. Low		Davis Poss	3
Carter, C. H. Leggett		Lillard Bibbins	3
Goodwin Burger	3	Young Seaver	
Colwell Hartley		Holberton Squires	3
	6		9

All this fun had its serious side which culminated in a get together meeting of jobbers, manufacturers and central stations on Saturday afternoon. First consideration was given to a paper by Edward N. Hurley, vice-chairman of the Industrial Trade Commission, telling of the need for better business methods and commending such organizations as the Electrical Supply Jobbers' Association, which, "if conducted in a spirit of mutual helpfulness, with the machinery of the government standing by subject to call, will help solve pressing problems and remove many of the present handicaps of business." The paper was read by Secretary Albert H. Elliott.

In the subsequent discussion Geo. C. Holberton emphasized the need for practicing as well as preaching co-operation. He suggested co-operative advertising by manufacturers and dealers, as the results of individual advertising brought only 20 per cent returns to the individual, while bringing 80 per cent returns to others.

W. W. Low gave an interesting talk and read a noteworthy paper on "Co-operation" based on confidence, loyalty and honesty. It is hoped to publish this paper in its entirety. It concludes with a suggested creed for jobbers, whereby they can continue to do business ethically.

Lee Newbert and Stanley Walton spoke briefly of the results of the co-operative sales campaign being carried on by the jobbers and the Pacific Gas & Electric Company. It is possible that definite results of the campaign will be available for the next meeting. A sales policy for handling electric ranges will be determined soon and Mr. Walton urged that a co-operative advertising campaign be started by the manufacturers. He also suggested that some plan be devised whereby a liberal allowance might be made to the consumer for old electrical devices which were replaced by newer models.

Ira J. Francis brought out the point that better results would be obtained from co-operative sales campaigns if the contractor-dealer were given specific assurance of profit instead of generalities and vague expectations. Benj. Scranton and T. E. Bibbins briefly explained the heating element situation, after which the meeting was brought to a close with a vote of thanks to Mr. Holberton of the Pacific Gas & Electric Company for showing moving pictures of the Golden Gate cable crossing.

Announcement of the cup winners was made at the golf-dinner on Saturday night, when Geo. C. Holberton presided as toastmaster. The jobbers' copper cup was presented to W. W. Low by R. D. Holabird with appropriate recital of its historical associations. The goddess of chance was called to decide the tie for the manufacturers' cup between T. E. Bibbins and F. H. Poss, Poss winning the toss. The Pass & Seymour cup was presented to C. C. Hillis by W. H. Seaver, the central station cup to Geo. Holberton by Ira Francis and the manufacturers' cup for match play to Garnett Young by F. H. Leggett. The dinner was brought to an end with a stirring address on loyalty and confidence by A. H. Elliott.

The following were in attendance:

R. M. Alvord, General Electric Co., San Francisco.
F. N. Averill, Fobes Supply Co., Portland.
H. L. Bargion, Washington Electric Supply Co., Spokane.
R. F. Behan, Westinghouse Elect. & Mfg. Co., San Francisco.
T. E. Bibbins, General Electric Co., San Francisco.
T. E. Burger and wife, Western Electric Co., Los Angeles.
Harry Byrne, North Coast Electric Co., Seattle.
C. H. Carter, Pacific States Electric Co., Los Angeles.
H. V. Carter, Pacific States Electric Co., San Francisco.
J. I. Colwell, Western Electric Co., Seattle.
R. J. Davis, Century Electric Co., San Francisco.
C. P. Deming, National India Rubber Co., Seattle.
E. Doherty, American Electric Heater Co., Detroit.
A. H. Elliot, Electrical Supply Jobbers' Assn., San Francisco.
Frank Fagan, General Electric Co., San Francisco.
I. J. Francis, John A. Roebling's Sons Co., Los Angeles.
W. L. Goodwin, Pacific States Electric Co., San Francisco.
N. W. Graham, Holabird-Reynolds Electric Co., Los Angeles.
S. B. Gregory, Arrow Electric Co., San Francisco.
C. B. Hall, Illinois Electric Co., Los Angeles.
A. H. Halloran, Journal of Electricity, Power and Gas.
C. C. Hillis, Electric Appliance Co., San Francisco.
G. C. Holberton, Pacific Gas & Electric Co., San Francisco.
R. D. Holabird, Holabird-Reynolds Co., San Francisco.
H. H. Hoxie, Elec. Railway & Mfrs. Supply Co., San Francisco.
W. H. Kerrigan, Journal of Electricity, Power & Gas.
C. D. La Moree, Westinghouse Elec. & Mfg. Co., Los Angeles.
F. H. Leggett and wife, Western Electric Co., San Francisco.
O. W. Lillard and wife, Gould Storage Bat. Co., San Francisco.
W. W. Low and wife, Electric Appliance Co., Chicago.
F. H. Murray, National Carbon Co., Los Angeles.
R. W. Murphy, Westinghouse Lamp Co., Los Angeles.
Lee Newbert, Pacific Gas & Electric Co., San Francisco.
R. F. Oakes, American Ever Ready Co., San Francisco.
James G. Pomeroy, Manufacturers' Agent, Los Angeles.
F. H. Poss, Benjamin Electric Mfg. Co., San Francisco.
Frank Quinn, Manhattan Electric Supply Co., San Francisco.
H. E. Sanderson, Bryant Electric Co., San Francisco.
W. H. Seaver, U. S. Steel Products Co., San Francisco.
B. F. Scranton and wife, American Electric Heater Co., Detroit.
H. B. Squires, Manufacturers' Agent, San Francisco.
H. W. Turner, Washington Electric Supply Co., Spokane.
J. A. Vandegrift, National Lamp Works, Oakland.
S. V. Walton and wife, Pacific Gas & Electric Co., San Francisco.
C. E. Wiggin, Dunham-Carrigan & Hayden, San Francisco.
W. C. Wurfel, Westinghouse Lamp Co., San Francisco.
Garnett Young, Telephone & Electric Equip. Co., San Francisco.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

The commission has authorized the Western States Gas & Electric Company to withdraw from the Girard Trust Company $9365.87 spent for betterments to the gas company's plant.

The commission has authorized the Roseville Telephone Company, Placer County, to issue $1670 worth of stock to reimburse its treasury for money expended.

The Midland Counties Public Service Corporation has applied to the commission for authority to renew promissory notes for $79,849.55 to the First National Bank of Coalinga, United States Aluminum Company, Western Electric Company and other corporations for not over one year, and at not over 7 per cent.

W. F. Whitter has applied to the commission for authority to sell his plant at Hemet, Riverside County, to the Southern Sierras Power Company. The price fixed is $4278.

The San Diego Consolidated Gas Company, San Diego County, has applied to the commission for authority to increase its capital stock from $3,500,000 to $6,000,000 and to issue and sell $500,000 worth of preferred stock.

The commission has issued an order authorizing the Alturas Electric Power Company, of Modoc County, to issue $90,000 of first mortgage 30-year 6 per cent bonds, and to execute a deed of trust to its property to secure a bonded indebtedness of $100,000.

WASHINGTON CONTRACTORS ORGANIZE.

As was recently announced in these columns, the organization of the Wahington Association of Electrical Contractors and Dealers has been perfected. The constitution and by-laws is practically the same as that of the Oregon association, as was printed in these columns last week. William H. Byers, of the NePage-McKenny Company has been chosen president; A. M. Jones, of the J. A. Roebling Sons, vice-president; Roy Worth, of the Pacific States Electric Company, secretary-treasurer.

The following code of principles has been adopted as the basis of action, being practically the same as the California and Oregon code:

Principles Which a Joint Committee of Contractors and Jobbers Advocate, with Outline of the Work Which the Joint Committee Proposes to Do.

It is a recognized fact that certain branches of the electrical industry are today in a very demoralized condition. As this is due largely to lack of proper co-operative effort on the part of the different branches of the industry, it is the belief of the committee that, with a proper organization whose primary interest is to educate its members to a greater responsibility, much good can be done in the way of properly serving the consumer and of creating a desire on his part to use electrical appliances and to adopt the idea, "Do it electrically," the slogan of "The Society for Electrcal Development."

As examples of what can be accomplished we only have to review the work of improvement clubs, societies, chambers of commerce and similar organizations throughout the country. Could individuals in the same period of time have brought about the reforms and changes in business methods that these association have accomplished for their membership? The Panama-Pacific Exposition, opened in San Francisco in 1915, is an evidence of co-operative association team work.

The central stations, through their strong organization, the National Electric Light Association, have brought the lighting and power industry to a high degree of development and, while doing so, have reduced rates to the consumer—neither of which could possibly have been accomplished through individual effort.

Electrical engineers, through the American Institute of Electrical Engineers, have been better prepared for their work through fuller knowledge of the requirements to be met and of the means of fulfilling them. This Institute is conducted purely for educational purposes and without individual profit to its members, except insofar as they improve themselves by participating in the work.

Electrical manufacturers and jobbers through co-operative work have done much toward educating themselves and as a result have placed their business on a firmer, more economical and more satisfactory basis. It has been proved through this work that, notwithstanding the increased cost of living and the consequent increase in the cost of almost every known commodity, the cost of electrical appliances has been steadily reduced and the quality of the article steadily improved. The principal effort on the part of these industries has been toward educating their members to the necessity of efficiency in order that the various branches may operate their particular business at a minimum of expense.

Architects have the American Institute of Architects as their National Association. We would hardly recognize as progressive an architect who is not a member of this Institute.

Some of this most valuable information is obtained through such membership and through his affiliation with other architects in association work.

While undoubtedly electrical products have made more rapid strides in the last ten years than any other industry, the building industry, generally, has kept apace with the times.

It is the belief of the committee, however, and it will be admitted by architects generally, that, while satisfactory progress has been made in the building industry, at least from an architectural standpoint, the electrical equipment in buildings of all classes has been steadily neglected, and it is common practice today, among many architects, to use electrical specifications which have been regarded by the electrical industry for a long time past as obsolete.

The occupant of any commercial type of building, hotel, apartment house, flat, bungalow, or private home generally realizes only too late that no provision has been made for the many electrical conveniences. Many attempts have been made on the part of electrical people to assist architects in the drawing of proper specifications but they invariably receive no encouragement as certain architects really believe that they have forgotten more about proper electrical installations than all the electrical men in the country ever knew and for this one reason they are impossible to approach.

They make no distinction between the reputable and the irresponsible electrical contractor. Their one idea seems to be to let the electrical contract simply on price. The result is evident.

Original cost of installation.....100 per cent
Extra before occupancy of building.. 25 per cent
Extra after building is complete.... 50 per cent

and the installation is still incomplete. An additional allowance, in the first place, would undoubtedly have provided a better installation with less cost to the owner.

Electrical contractors have their national and state associations which have done much to educate their members in the proper conduct of their business and through their local meetings and state conventions have made possible an exchange of ideas that has tended to elevate the standard of work.

Notwthstanding the great results that have been accomplished by the association, there are many electrical contractors who have failed to recognize the advantages to be gained by such association effort. This is evidenced by the present state of the electrical contracting business.

In the past, when a contractor has been approached and the suggestion offered that he become a member of the association, he has immediately asked, "What am I to gain by joining it?" The answer to this question is that he gets out in proportion to what he puts in. Having put in nothing in the past, nothing is what he has gotten out.

It is the belief of the committee that an electrical contractor unattached is unable to keep apace with the progress of the industry and, consequently, is unable to properly serve his customers.

If he will become a member of the association and will give it his support, it would be impossible to estimate the benefits he will derive from it, as evidenced by the results of assocation work in other lines of endeavor, whether commercial or political.

As we have shown above that a competent architect should of necessity be a member of the American Institute of Architects or in some way affiliate with its local chapters, so it is clear that an electrical contractor should for the same reasons be a member of some association which represents his craft.

It is fully recognized that the economic and proper channel of distribution of electrical supplies is through the electrical supply jobber to the dealer and contractor, who, in turn, serves the consumer. By this method the dealer and contractor is enabled to have the advantage of a complete stock of electrical merchandise in the warehouse of the jobber which can be drawn on at any time, no matter whether it is one item or a hundred, and can be assured of prompt shipments and satisfactory service from every standpoint.

The jobber makes it his business to keep in close personal contact with the dealer and contractor in his territory, studies his wants and plans to serve his needs, no matter what they may be. Through frequent calls of his salesmen he is often enabled to give valuable information, keeping him advised of the new lines of standard goods on the market and furnishing technical data or give such other information as may be useful from time to time.

He is frequently able to be of service by carrying his contractor or dealer, who has been tied up financially on account of delays in jobs over which he has had no control.

This kind of service can not be had where the contractors and dealers do business at long range with people who are not in close touch or sympathy with their conditions or problems.

The dealer and contractor is the natural channel for distributing various electrical devices to the consuming public. He carries the material in stock and displays it on his counters and in his show windows. The consumer is thus enabled to see the material which he is purchasing and knows that he is getting full value for his money. He can get promptly any information he needs or instructions in the use of the various electrical devices which is a service that could not be rendered satisfactorily by correspondence with some distant point.

The object of this joint committee is to promote the use of electrical appliances and to influence the public to adopt the idea: "Do it electrically."

The co-operation of the central station in each district is highly desirable and a closer relationship with the architect and those engaged in the industry must be maintained. In the past, the industry has failed to provide suitable show rooms at which the consumer can obtain electrical appliances, therefore we will encourage the establishing of proper stores where material can be obtained at retail.

To accomplish this end, a campaign of education is about to be instituted. It provides for visits by the committee to all parts of the state, where public lectures will be given, supplemented by moving pictures, stereopticon views and working demonstrations of electrical appliances.

In order to gain the full confidence of the public in the industry we represent, the class of material furnished and the excellence of workmanship in its installation must be of the highest order. We should never recommend for sale an article in which we have not absolute confidence, and a full knowledge of the functions it will be called upon to perform.

We should not consider an installation as tending to promote the best interests of the industry, unless it has met with the unqualified conviction on the part of the contractor that it is of the highest class. An installation made by an electrical contractor, simply because it will pass inspection is undoubtedly bad practice.

We recognize that, in our business, probably more than in any other, the public is woefully ignorant of the quality and merits of electrical devices. Whether or not they are satisfied depends upon how we serve them. We should recognize that the National Electric Code, while having accomplished a great good, does not to the fullest extent accomplish the desired results for the reason that it does not distinguish between standards of material.

We will advocate the grading of material by the National Fire Protection Association.

We recognize that local inspection bureaus are not responsible for installations in compliance with architects' specifications.

We will advocate the employment of one or more competent electrical engineers, whose duty it will be to furnish architects with certificates, certifying that work has been performed in accordance with the specifications embodied in the contract.

Work may be performed which in every respect meets the requirements not only of the National Fire Protection Association, but local, state and municipal inspection bureaus, which is not a credit to the electrical industry. We are opposed to electrical contractors, who, after executing a contract, endeavor to substitute material of lower grade. We advocate that the various electrical contractors' associations should assume the responsibility for seeing that their members perform work in accordance with specifications without attempting to evade their contract in any detail.

We believe that with proper co-operation on the part of the architect and other allied interests, the various state associations of electrical contractors will ultimately be able to guarantee on behalf of their members the completion of any contract entered into.

We will ascertain the names of all societies of architects, times and places of meeting, and will endeavor to have representative electrical engineers as well as members of our joint committee appear before these associations to explain the necessity of not only the proper drawing of, but also the compliance with recognized modern specifications.

Caution should constantly be exercised to see that only those contractors are admitted to membership of an association whose character and honesty are unquestioned and who have an established reputation for square dealing.

PORTLAND ELECTRICAL CONTRACTS.

M. J. Walsh & Company have rewired a portion of the Chicago Market at 187 Third street.

E. L. Knight & Company have been doing some rewiring for G. W. Gordon & Sons at 9 Third street.

W. C. Wight is instlling the new electric lighting system for the Eastern & Western Lumber Company.

Scott Electric Company has wired the Western Fluff Rug Company's place of business at 54 Union street.

Skeen Electric Company are installing the motors at the Clark & Wilson Lumber Company's plant near Linnton.

Pierce-Tomilson Electric Company are doing some remodeling work for the Corbett Estate at 80 Front street.

Miller & Halls have just completed an electrical installation for the Brownsville Woolen Mills at 165 Third street.

I. B. Sturges has the contract for the wiring in the apartment house being constructed at Broadway and Clay streets

Canderlip & Lord have the contract for the new White Company garage being built at W. Park and Couch streets.

Skeen Electric Company is rewiring the lighting system for the Pacific Bridge Company at their plant on E. Water street.

The Diamond Flour Mill Company at The Dalles, Oregon, is being electrified, the work being done by the owners.

E. S. Knight & Company have been installing an electrical system for the Portland Seed Company at 135 E. Second street.

Smith McCoy Electric Company have the electric contract for the new motion picture theater being installed in the Alisby Building.

R. E. Davis is rewiring the plant of the Electric Steel Foundry Company at 808 York street, which was recently destroyed by fire.

Grand Electric Company have the contract for wiring the new building being constructed for the Mutual Creamery, 26 E. Tenth street North, also Multnomah Camp Hall, 106 E. Sixth street.

The Bend Water, Light & Power Company are installing approximately 350 h.p. in induction motors to operate the new planing mill being constructed by the Brooks-Scandon Lumber Company at Bend, Oregon.

Morrison Electric Company have done the remodeling work in connection with the Failing Estate Building at 140 Fifth street. They also have the contract for the new Glafke warehouse on the East Side of the river.

NEWS NOTES

ILLUMINATION.

RIVERSIDE, CAL.—The board of public utilities has let the contract for furnishing incandescent lamps to the city for the ensuing year to the Westinghouse Electric Company.

FULLERTON, CAL.—The board of trustees has accepted a new lighting contract with the Southern California Edison Company which provides all night service and increased candle power lights.

MARSHFIELD, ORE.—Fire damaged the electric plant of the Oregon Power Company at North Bend on March 2 to the extent of about $5000. Coos bay cities were in darkness for 30 minutes, until the auxiliary plant could be connected up.

RENO, NEV.—Plans for the installation of a modern system of electrolier lighting have been agreed upon by the city officials, who have been working on the matter in conjunction with the Reno Power, Light & Water Company. The total cost will not be more than $5000.

MARTINEZ, CAL.—At the annual meeting of the stockholders of the Contra Costa Gas Company, directors were elected as follows: S. Waldo Coleman, John C. Coleman, Louis Glass, Ambrose Gherini and L. W. Prior. The directors organized by electing S. Waldo Coleman, president and general manager; Louis Glass, vice-president; and L. W. Prior, secretary and treasurer.

SPOKANE, WASH.—The Spokane Building Owners & Managers' Association has gone on record as favoring the erection of a lighting system on Riverside west of Washington street. An investigation of the cost of the system and a report on the adoption of ornamental electroliers is being prepared by a special committee consisting of C. E. Mallette, W. J. Kommero and Victor Dessert.

ANAHEIM, CAL.—A contract has been signed with the Southern California Edison Company to take electricity for lighting and power purposes in this city. The rate made was 1 1-3 cents per kilowatt hour for first 25,000, and 1 cent per kilowatt for all in excess of that amount. The minimum amount to be used each month is 31,666 kilowatts at a cost of $400 per month delivered at the municipal power plant.

ROSEBURG, ORE.—A. Welch, formerly interested in the Douglas County Water & Light Company, of this city, has sold his stock to John Kiernan ,a Portland capitalist. The transfer of Mr. Welch's interests to Mr. Kiernan also included half of the stock in the Seaside Light & Power Company. The local company is capitalized at $600,000. The new officers of the company are: William Pollman of Baker, president; J. B. Yeon of Portland, vice-president, and John Kiernan, director and half owner. It is understood that extensive improvements will be undertaken.

TRANSMISSION.

LOS ANGELES, CAL.—It has been announced that the harbor commission soon proposes to take up with the power bureau the question of having transmission line for aqueduct power extended to the harbor district.

MYRTLE CREEK, ORE.—The town council has voted to employ Germond & Frear of Roseburg to make a survey and give estimates of the probable cost of installing a power project in the South Umpqua River near the mouth of Myrtle Creek.

OKANOGAN, WASH.—A plan is on foot by land owners along the river between Okanogan and Malott to secure the establishment of a small plant that will furnish the farmers with electricity. A committee consisting of S. G. Duley, T. F. Foster and Chas. Rumbolz has been named to investigate.

TROY, MONT.—The power site and water right of the company owning the Lake Creek Falls power project is reported sold to Lee Greenough and associates controlling the Banner and Bangle mines south of town. The power will be used to run the proposed electric line to the mines and other equipment of the company.

LOS ANGELES, CAL.—The public service commission has adopted three resolutions providing that proper officials shall make application to the U. S. Department of Agriculture for preliminary power rights, including rights of way for reservoirs ,conduits, dam sites, etc., on Big Pine Creek, Cottonwood Creek, and Owens River Gorge.

TRANSPORTATION.

ONTARIO, CAL.—A Pacific Electric loop which has long been considered a possibility, is now being discussed as a probability. This line would touch the cities of Ontario, Upland, Claremont, Pomona and Chino.

NEEDLES, CAL.—It is stated that Peter McFarlane of El Paso is discussing the matter of a bridge across Colorado River at Oatman. He promises to build an electric railroad from here to Oatman within a year if he can be assured of a bridge across the river.

SALT LAKE, UTAH.—Application for a franchise to construct an electric railway from Tenth South street on Twenty-first E. street through Holliday, up Big Cottonwood to Brighton and to the mines in the forks of the canyons has been made by Le Grand Young.

KLAMATH FALLS, ORE.—Residents of the Malin section, 35 miles south of this city have taken up the matter of securing an electric railway from Malin to Klamath Falls, and they are now asking Klamath Falls to help in the matter. The farmers near Malin are willing to furnish the right of way and do the necessary grading for the road, providing Poe Valley and Klamath Basin will do the same.

OAKLAND, CAL.—A movement to open Twenty-second street through the Moffitt estate property from Broadway to Lake Shore avenue will be started by property owners in a short time, following the removal of the old residence and stables now being wrecked. This is the first step in the projected extension of the Key system's Twenty-second street line to Piedmont.

TELEPHONE AND TELEGRAPH.

CALAVERAS, CAL.—Application for permission to erect a telephone line over the county roads has been made by A. Guttinger.

OTHELLO, WASH.—O. G. Vroman has asked a permit of the city council to erect poles and install a telephone system in the town.

ETTERSBURG, CAL.—Arrangements are being made for the construction of a telephone line from Ettersburg and vicinity to connect with the Briceland line.

NAMPA, IDAHO.—The Mountain States Telephone & Telegraph Company is preparing to extend its service northeast from Bowmont to Kuna. The construction work will cost about $5000.

HERMOSA BEACH, CAL.—Upon application of the Pacific Telephone & Telegraph Company for a franchise here, sealed bids will be received for the sale of said franchise up to April 18th.

PATTERSON, CAL.—The First Farmers' telephone line for Patterson was organized at a recent meeting. Rollie Peters was elected president and E. R. Leedy, secretary-treasurer. Steps for the construction of the line will be taken immediately.